

19 November 1971

MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, GALLIUM ARSENIDE, MIXER
 TYPE 1N5764,
 1N5764M and 1N5764MR

1. SCOPE

1.1 Scope. This specification covers the detail requirements for Gallium Arsenide, Low Barrier, High Sensitivity, Schottky-Barrier Semiconductor Diode, for use as a first detector in Ku-band equipment.

1.2 Ratings and characteristics.

F_o	1/G	L	N	SWR	Burnout R.F. Power
<u>db</u>	<u>ohms</u>	<u>db</u>	<u>ratio</u>	<u>ratio</u>	<u>Watts</u>
Minimum ---	400	---	---	---	1.5
Maximum 7.0	600	5.0	1.6	1.5	

OPERATING AMBIENT TEMPERATURE: -65° to $+150^{\circ}\text{C}$

STORAGE TEMPERATURE: -65° to $+150^{\circ}\text{C}$

BAROMETRIC PRESSURE, REDUCED: 8 min Hg

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein.

SPECIFICATION

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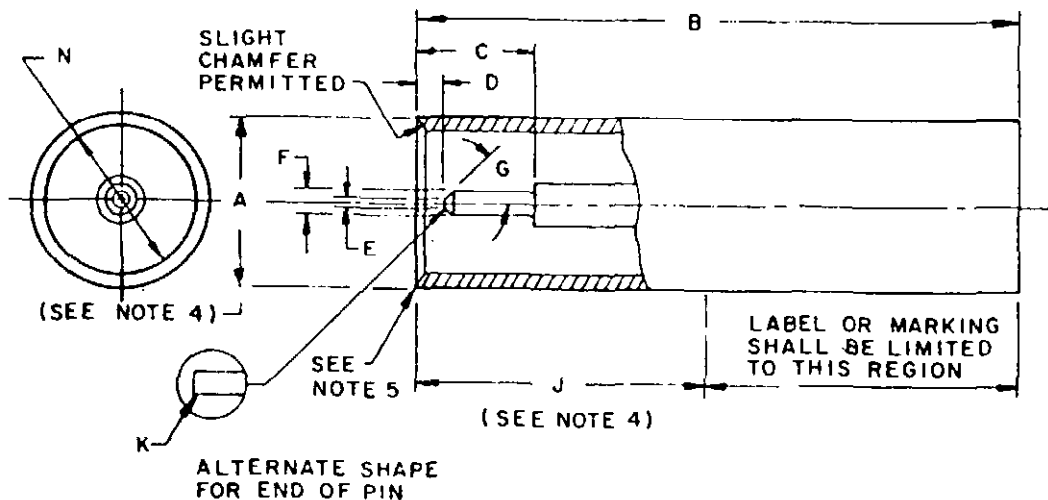
MIL-S-19500 - Semiconductor Devices, General Specification for.

STANDARD

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MIL-STD-750 - Test Methods for Semiconductor Devices.

DRAWINGS



LTR	DIMENSIONS			
	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.215	.220	5.46	5.58
B	.734	.766	18.64	19.45
C	.147		3.73	
D	.011	.028	.28	.71
E	.007	.017	.18	.43
F	.031	.033	.78	.84
G	42°	48°	42°	48°
J	.406		10.31	
K	.007	.017	.18	.43
N	.179	.189	4.55	4.80

NOTES:

1. Finish: .0002"(.005 mm) tin plate over nickel flash, or .001"(.025 mm) gold plate or .0001"(.0025 mm) silver plate.
2. Axis of center conductor(pin) not to deviate from axis of outer conductor referred to its outside diameter more than .004"(.101 mm).
3. Forward polarity units shall have the cathode connected to the center pin. Reversed polarity units shall have the anode connected to the center pin.
4. Outside diameter, .215"(.546 mm) to .220"(.558 mm), applies for length of dimension J.
5. This device shall be free of sharp edges and burrs.

FIGURE 1. Semiconductor device, diode, type 1N570 (suffix R (reverse polarity), suffix M (matched forward pair), and suffix MR (matched forward and reverse)).

Defense Electronics Supply Center

D65084	- Test Holder for Microwave Diode Type 1N78.
B66054	- Adapter for Burnout Test.
C66058	- Burnout Tester for Microwave Diodes.

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 General. Requirements for semiconductor diodes shall be in accordance with MIL-S-19500, and as specified herein.

3.2 Abbreviations and symbols. The abbreviations and symbols used herein are defined in MIL-S-19500 and as follows:

$1/G$	- - - - -	Reciprocal of conductance (IF impedance).
SWR	- - - - -	Standing wave ratio.
P	- - - - -	Power from local oscillator.
P_K	- - - - -	Peak RF power.
P_{rr}	- - - - -	Pulse repetition rate.
f_o	- - - - -	Frequency of operation.

3.3 Design, construction, and dimensions. The semiconductor diode shall be of design, construction and physical dimensions specified in figure 1. Forward polarity units shall have the cathode connected to the center pin. Reversed polarity units shall have the anode connected to the center pin.

3.3.1 Plating. The diode shall be plated as specified in figure 1.

3.4 Performance characteristics. Performance characteristics shall be as specified in tables I, II, and III.

3.5 Marking. The marking shall be as specified in MIL-S-19500.

3.5.1 Matched diodes. The "M" suffix for matched diodes shall be omitted in the type designation on each device. Matched diodes meeting the requirements of this specification shall be packaged with a statement to the effect.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection shall be in accordance with MIL-S-19500, and as specified herein.

4.2 Test Conditions. Unless otherwise specified herein the Test Conditions, when applicable, shall be as follows:

$$\begin{aligned}P &= 1.0 \text{ mW} \pm 5\% \\f_o &= 16.0 \text{ GHZ} \pm 10 \text{ MC} \\Z_m &= 500 \pm 1\% \text{ ohms} \pm J_o \text{ ohms} \\R_1 &= 100 \pm 1\% \text{ ohms}\end{aligned}$$

4.3 Qualification inspection. Qualification inspection shall consist of the examinations and tests specified in Tables I, II, and III, except the matched-pair requirements in subgroup 3, Table I.

4.4 Quality conformance inspection. Quality conformance inspection shall consist of the examinations and tests specified in Groups A, B, and C.

4.4.1 Group A inspection. Group A inspection shall consist of the examinations and tests specified in Table I.

4.4.2 Group B inspection. Group B inspection shall consist of the examinations and tests specified in Table II.

4.4.3 Group C inspection. Group C inspection shall consist of the examination and tests specified in Table III.

4.5 Method of examination and test. Methods of examination and tests shall be as specified in Tables I, II, and III, and as follows:

4.5.1 High-temperature operation. The semiconductor diode shall be placed in the mixer holder. The ambient temperature of the diode, with test conditions specified for the overall noise figure shall be raised to + 150°C and maintained at this temperature until equilibrium is reached. The F_o shall then be determined and shall be less than 10. dB. The temperature shall then be returned to 25±3°C at which time F_o shall be less than the specified limit.

4.5.2 Matched pair, "M" suffix (forward polarity). The matched forward pair (M suffix) shall consist of two diodes, tested to requirements of subgroup 4, Table I, having the cathode connected to the center pin.

4.5.3 Matched pair, "MR" suffix (forward and reverse polarity). The matched forward and reverse pair (MR suffix) shall consist of two diodes, tested to requirements of subgroup 4 Table I: one diode having the cathode connected to the center pin (forward polarity) and the second diode having the anode connected to the center pin (reverse polarity).

4.5.4 Matched pair, Semiconductor devices shall be considered matched pairs when the following parameters; L , NR_o , and Z_{if} are within specified limits, over the entire 0.5 to 2.0 MW local oscillator range.

4.5.5 Overall Noise Figure. The following parameters LC , NR_o and NF_o may be determined by the measurement of any suitable combination and the actual measured NF_{IF} . When NF_o is to be determined by calculation, where NF_{IF} is assumed at 1.5 ± 25 db, the measurement of both LC and NR_o parameter shall be required.

4.5.5.1 Mixer Holder. The mixer holder, per drawing D-65084 or JAN Drawing 201, when terminated with the matched load, per drawing C-65101 shall have a maximum vswr of 1.05:1.

Table 1. Group A Inspection.

Method MIL-STD-750	Examination or test	Details	LTPD	Symbol	Limits		Units
					Min	Max	
	<u>Subgroup 1</u>		3				
2071	Visual and Mechanical Examination						
	<u>Subgroup 2</u>		3				
	R.F. Burnout	P=1.5 Watts f=16 GHZ tp=3 nanosec. Prr=1000 min. t=1 min					
4136	Standing Wave Ratio			SWR		1.5	Ratio
4126	Overall (average) Noise (See 4.5.5 & 4.5.5.1) Figure			$\overline{F_o}$		7.0	db
4126	Overall (average) Noise (See 4.5.5 & 4.5.5.1) Figure	Except: P=0.2 mW		$\overline{F_o}$		9.0	db
	<u>Subgroup 3</u>		3				
4116	I.F. Conductance			$1/G$	400	600	ohms
4151	Rectified Current			I_o		0.7	mAdc
	<u>Subgroup 4</u>		3				
	Matched Pair Requirements: (See 4.5.2, 4.5.3 and 4.5.4)						
4101	Conversion Loss Unbalance			ΔL		0.3	db
412†	Output Noise Ratio Unbalance			ΔN		0.2	
4116	I.F. Conductance Unbalance			($1/G$)		20	ohms

Table II. Group B Inspection.

Method MIL-STD-750	Examination or test	Details	LTPD	Symbol	Limits		Units
					Min	Max	
<u>Subgroup 1</u>							
2066	Physical dimensions	(See Figure 1) Dim. A, C, D F, and N. 7 (Dim. E, G, K, and note 1 are for qualifica- tion only.)	7	---	---	---	---
<u>Subgroup 2</u>							
1051	Thermal shock (temperature cycling)	Test Condition F		---	---	---	---
1021	Moisture resistance	Omit initial con- ditioning		---	---	---	---
End points:							
4126	Overall (average noise Figure (see 4.2, 4.5.5 & 4.5.5.1)			$\overline{F_o}$	---	8.0	dB
<u>Subgroup 3</u>							
2016	Shock	Nonoperating; 500 G; $t=1.0$ msec; 5 blows in each orientation: X_1 , Y_1 , and Y_2		---	---	---	---
2056	Vibration, variable frequency	Nonoperating: 15 G, 50 to 2,000 Hz		---	---	---	---
2006	Constant acceleration	Nonoperating; 20,000 G, X_1 , Y_1 , and Y_2 orientations		---	---	---	---
End points: (Same as subgroup 2)							
<u>Subgroup 4</u>							
---	High temperature opera- tion: (see 4.5.1)	$T_A=150^\circ\text{C}$	7	---	---	10.0	dB
4126	Overall (average noise figure (see 4.2, 4.5.5 & 4.5.5.1)			F_o	---	8.0	dB

Table II. Group B Inspection - Continued

MIL-STD-750	Examination or test	Details	LTPD	Symbol	Limits		Units
					Min	Max	
	<u>Subgroup 5</u>		$\lambda = 10$				
1031	High-temperature life (non-operating)	$T_A = 150^\circ\text{C}$		---	---	---	---
	End points: (Same as Subgroup 2)						

Table III. Group C Inspection

MIL-STD-750	Examination or test	Details	LTPD	Symbol	Limits		Units
					Min	Max	
	<u>Subgroup 1</u>		10				
4101	Conversion loss (See 4.2)			L	---	5.0	dB
4121	Output noise ratio (See 4.2)	$R_e = 300$ ohms		N	---	1.6	ratio

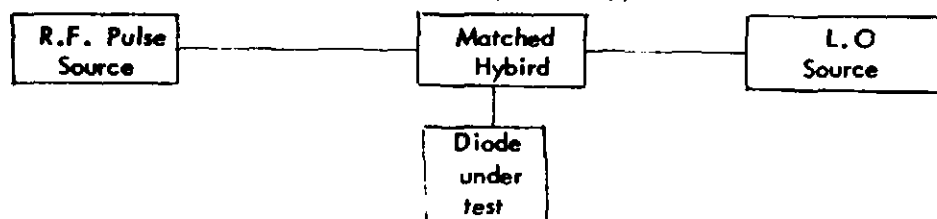
5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery. Preparation for delivery shall be in accordance with MIL-S-19500.

6. NOTES

6.1 The notes specified in MIL-S-19500 are applicable to this specification.

6.2 RF Pulse Test. The RF Pulse Test will be done in D-65084 or JAN Drawing number 201 test Holder, with $R_L = 100$ ohms per the appended circuit.



6.3 The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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